

The most important thing we build is trust.

## Messenger VETA Receiver Decoder (MVRD)



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## Revision History

Version	Date	Main Changes from Previous version	Created by
X1	02-24-2010	Initial Release	RM
X2	06-11-2010	Genlock and Embedded Audio are added	RM

## 1. Acronyms

This section lists and describes the various acronyms used in this document.

Name	Meaning
16QAM	16-state Quadrature Amplitude Modulation
A/V	Audio/Video
AES	Advanced Encryption System
ABS	Basic Encryption System (8 bit)
COFDM	Coded Orthogonal Frequency Division Multiplexing
CVBS	Composite Video
BDC	Block-Down Converter
FEC	Forward Error Correction
GUI	Graphical User Interface
I/O	Input/ Output
KBaud	Kilobaud per second
Kbps	Kilobits per second
M2D	Messenger Decoder
M2T	Messenger 2 Transmitter
Mbps	Megabits per second
MDL	Messenger Digital Link
MER	Modulation Error Rate
MPEG	Moving Picture Experts Group
MVRD	Messenger VETA Receiver Decoder
NTSC	National Television System Committee
PAL	Phase Alternation Line
QPSK	Quadrature Phase Shift Keying
QAM	Quadrature Amplitude Modulation
RF	Radio Frequency
RX	Receiver
S/N	Signal-to-Noise Ratio
THD	Total Harmonic Distortion
TX	Transmitter
VDC	Volts (Direct Current)
VR	VETA Receiver
VT	VETA Transmitter
VDR	VETA Digital Repeater
CSM	Compact Surveillance Modem
UDP	User Datagram Protocol
VNA	VETA Network Adapter

## 2. Introduction

### 2.1 About the Manual

GMS User Manuals focus on providing the end user an easy to understand operational instructions to quickly setup and deploy the equipment. The GMS Technical Operation Manuals focus on the technical details and setup of the equipment. The Technical Manuals also provide a more in depth explanation of the settings and specifications of the equipment that technicians can use to verify the operational status.

This manual provides information on how to operate the MVRD (Messenger VETA Receiver Decoder) as well as pertinent technical information related to the overall system.

The manual is divided into three main sections:

#### **Getting started and basic operation**

This section describes to users how to deploy and use a MVRD unit.

#### **Advanced operation**

This section describes the operation of the system in more detail, concentrating particularly on advanced use of Local Control Panel and the GUI.

#### **Technical reference**

This section provides technical specification and control protocol data and will be of interest to those integrating the MVRD into larger systems or using unusual configurations.

The MVRD is pre-configured by GMS prior to shipment (based on customer requirements), thus is ready to work “right out of the box”.

MVRD is supplied with the following cables:

- 780-C0484 Power Cable w/AC/DC Power Supply
- 780-C0456 MVRD USB Control Cable

► Additional cables and antennas may be delivered by GMS based on customer application. Contact GMS for further information.

### 2.2 Warranty

GMS offers a 12 month standard product warranty. During this period, should the customer encounter a fault with the equipment we recommend the following course of action:

- Check the support section of the website for information on that product and any software/firmware upgrades.
- If fault persists call our support line and report the fault. If fault persists and you are informed to return the product, please obtain an RMA number from the GMS support department or website and ship the equipment with the RMA number displayed and a description of the fault. Please email the support section the airway bill/consignment number for tracking purposes.

Depending on the nature of the fault GMS endeavor to repair the equipment and return it to the customer within 14 days of the item arriving at our workshops. Obviously it is impossible to cater for all types of faults and to manage 100% replacement part availability, and delays are sometimes inevitable. Please contact GMS for details of packages that can be tailored to meet your individual needs, whether they are service availability, technical training, local geographic support or dedicated spares holdings.

## 2.3 **Safe Operating Procedures**

- Ensure that the power supply arrangements are adequate to meet the requirements of VETA product.
- Operate within the environmental limits specified for the product.
- Only authorized, trained personnel should open the product. There are no functions that required the User to gain access to the interior of the product.

### 3. General System Information

The MVRD (Messenger VETA Receiver Decoder) receives and demodulates DVB-T 2k carriers' signals with bandwidths of 6, 7 or 8 MHz; additionally, optional 1.25 or 2.5 MHz RF bandwidths with 400 carriers allow both increased reception range and larger quantity of simultaneous A/V links to operate in the same frequency band. The wider bandwidths provide greater throughput that allow the system to transfer the highest quality video.

The MVRD has dual Diversity inputs and internal RF Block-Down Converters (BDCs) with a user selected (at time of purchase) frequency band. The MVRD's Maximal Ratio Diversity Combiner provides optimum reception in difficult fading and multipath environments. Additionally, the Diversity combining can provide up to 2.5 dB in link performance, increasing the receiver's sensitivity to -97.5 dBm at 8 MHz bandwidth.

One of the biggest problems encountered in the transition from analog to digital A/V systems has been the inherent digital coding/decoding delays that in some digital systems are 400ms or more. The VETA Transmitters & Receivers employ internal MPEG-2 or MPEG-4<sup>(4)</sup> (User Selectable) Encoders and Decoders with specially designed 'low-delay' coding technology, which provides an end to end latency down to 44ms *without* the introduction of any further MPEG encoding artifacts. This ensures that the picture you see is what is happening *now* - crucial for applications such as surveillance, and law enforcement, where personnel are reacting to real-time events.

The MVRD also includes internal low-latency Audio/Video Decoder (MPEG-2 or MPEG-4<sup>(\*)</sup>) and output circuits that provide video, two audio and data channels. Security of transmission is ensured by the use of Standard ABS encryption or, for greater security, the optional AES 128 or 256 bit scrambling algorithms.

Control and status monitoring can be accomplished via the VR Front Panel or via an external IBM PC and GMS' M.S. Windows application control software. Critical performance parameters like Signal to Noise Ratio (SNR), Pre and Post FEC Bit Error Rate (BER) and Packet Errors are provided both on the On-Screen Display and M.S. Windows control program.

The MVRD includes an optimal internal low-latency Audio/Video (SD Only) MPEG-2/4 Part 4 Decoder and output circuits that provide composite video and two audio channels. Ancillary Data extraction is available in all Modes. Security of transmission is ensured by the use of Standard ABS encryption or, for greater security, the optional AES 128 or 256 bit scrambling algorithms.

<sup>(\*)</sup> Option Dependant

#### 3.1 Product Control & Status Monitoring Approach

GMS Transmitters and Receivers provide programmable presets or configurations that can be set up through special programming software by Administrators. Configurations are selected by the user through M.S. Windows Application programs. Administrators define the configurations for specific applications. Each configuration completely defines all of the Unit parameters including center frequency, output RF power level (for TX only), modulation parameters, Video, Audio, User data and encryption. Field personnel will select specific configuration via pre-determined guidance from the Administrators. Matching the Transmitter operation to the Receiver operation is as simple as selecting

the same configuration for both. For example: If the Transmitter is set to configuration #3, then the Receiver needs to be set to configuration #3 for them to operate together.

### 3.2 Understanding Configurations

MVRD equipment features sixteen user selectable and programmable configurations. These allow the user to store the most commonly used channels for quick selection. The *Current Config* is defined as the number of the currently selected configuration 1 to 16. The *Current Config* can be changed by loading one of the 16 Config-s in the Main Window of Control Software. The parameters in Current Config-s can be edited in the MVRD menu using the PC Control application. Any modifications made to system settings will be saved in the current Config. All changes that are applied saved permanently.

## 4. MVRD Local Control

### 4.1 Introduction

As with all GMS Cobham surveillance products, the MVRD uses “Set-Up Groups”/ “Profiles” (Up to 16) to allow the receiver to be completely pre-configured by Administrators prior to deployment. These set-up groups define all of the operating parameters (e.g. frequency, bandwidth, FEC, Decryption On/Off) available to the users. Users on both the TX and RX side only need to be directed to which set-up group number to use. Normally, the TX and RX would each use the same set-up group number.

GMS offers several control options, including local control and M.S. Windows Applications for remote control and status monitoring.

The MVRD’s front panel display and keyboard are used for both local control and status monitoring. The MVRD has a local control panel that allows the selection of up to 16 set-up groups/configurations. Status indicators are provided for RF Signal Strength, Demod lock, SNR, the presence of a Transport Stream, audio, video, data, and Decryption Active. This section describes the various displays and controls that are used for local control. Refer to **Error! Reference source not found.**

### 4.2 Main Display

The flow chart of the MVRD main display is shown on **Error! Reference source not found.** The LCD backlight lights up when the power switch is turned on. It takes an about 5 seconds for unit to boot. The initialization screen displays the product type. After another 5 seconds the display changes to Main Status Display. Depending on the mode that MVRD is in (ASI In or RF In) different menus will be displayed on the Front Panel.

Pressing the **CNTRL** button will take you through a series of **Select** or **Status** menus. Pressing **Enter** button takes you into the corresponding submenus.

#### 4.2.1 Main TS screen

If the unit is in ASI In mode, the main screen will look as shown belo:

T	S	:	N	P	R	G	:	N	A	S	I	I	N
									V	I	D	:	N

- ❖ **TS**: – Transport Stream Present? Next character shows **Y** when the system is processing a TS and **N** when it is not.
- ❖ **PRG**: – Program Present? ? Next character shows **Y** when the system detects at least one program in the TS and **N** when it is not. Program is a group of services that includes one or more of audio, video and ancillary data. This is detected in the PAT table of the TS.
- ❖ **ASI IN** – Indicates that the input mode is set to *ASI In*.

- ❖ Lower left 10 characters – If Video is Present shows the video format.
- ❖ **VID:** – Is Video Present in the Program? Next character shows **Y** when the system is processing a TS and **N** when it is not.

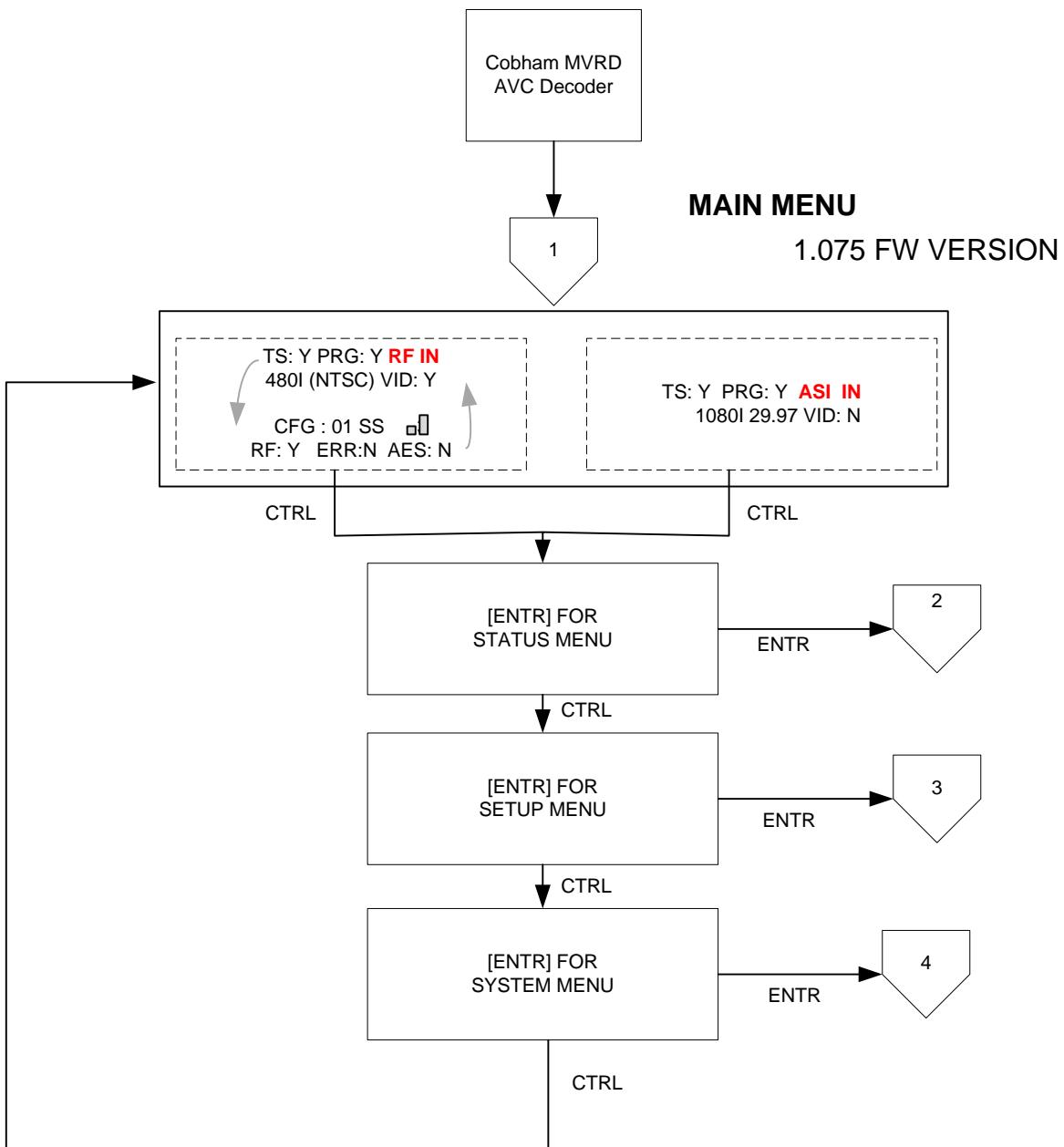
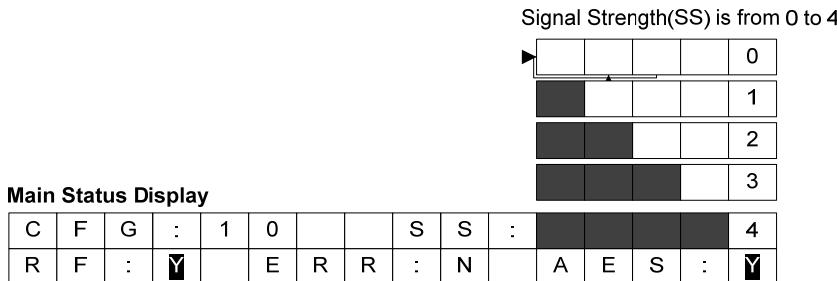


Figure 1 – Main Display & Control Displays

#### 4.2.2 Main RF screen

If the unit is in RF In mode, every 30 seconds the TS Screen will interchange with main RF screen, shown in the following Figure:



- ❖ **CFG:** – Displays Configuration *Group* currently in use. The two digits to the right show the current configuration group (1 to 16).
- ❖ **SS:** – Signal Strength. The digits to the right show the RF signal strength as both a bar graph and a level number. The channel with higher Signal Strength is displayed.
- ❖ **RF:** – **Y/N** indicates that the receiver is locked to an incoming signal or not.
- ❖ **ERR:** – Error Indicator. There are several reasons for Error to occur, including:
  - TS is not present
  - PMT (Program MAP Table) indicates services that are not present in the TS
  - Incompatible Compression Type , cannot decode the incoming data
  - Internal HW/FW Error, will output a code that is meaningful to factory personnel.
- ❖ **AES:** – **Y** means that the incoming stream is encrypted. To receive and process the stream correctly decryption must be enabled with the correct key. **N** means that the incoming stream is not encrypted.

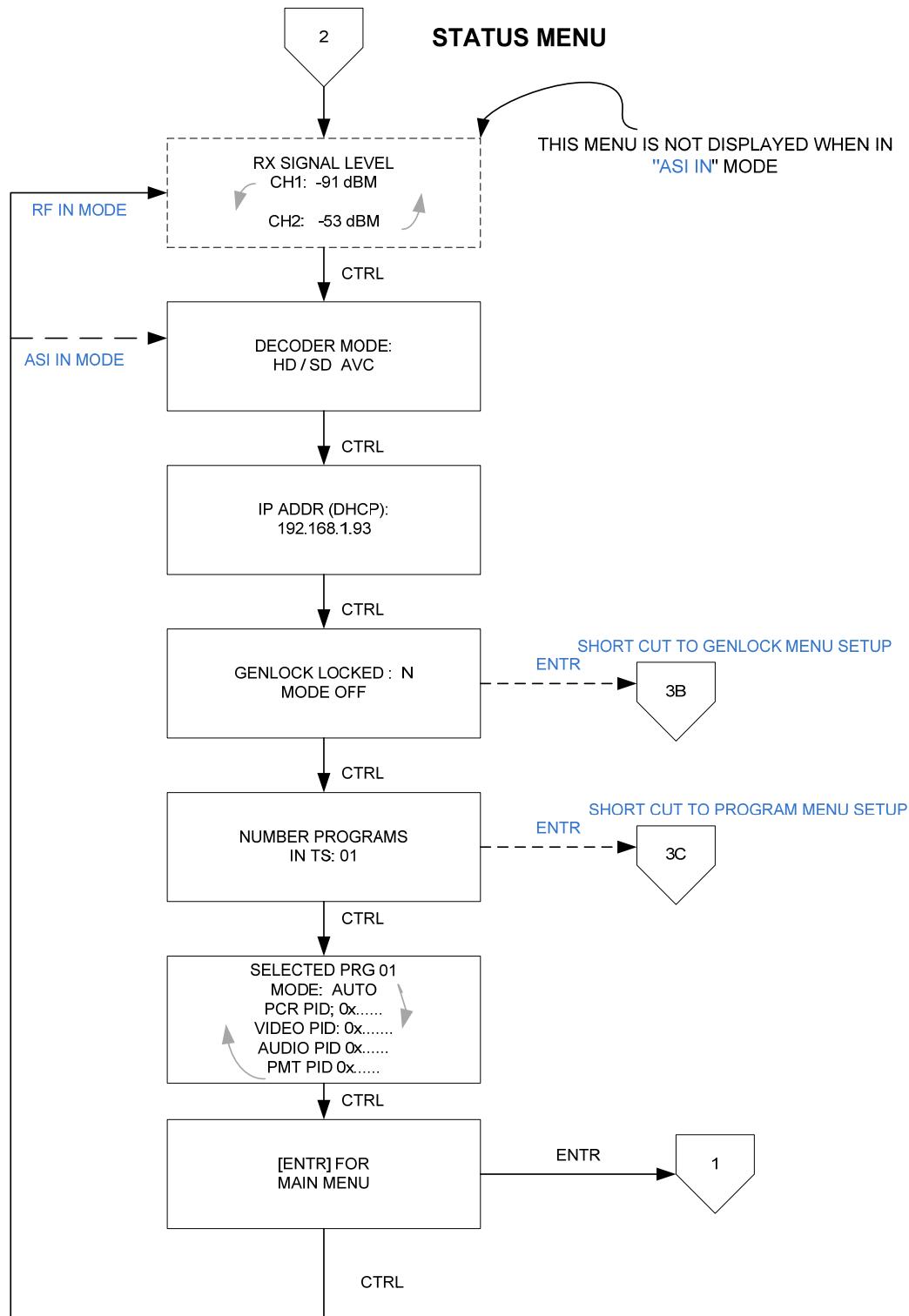
#### 4.3 Status Menu

This menu can be accessed from the Main Display by pressing CNTR button once. The flow chart of MVRD Status Menu is shown in Figure 2.

##### 4.3.1 Signal Strength

If the unit is in ASI mode, this screen is not displayed. When the RX is in RF reception mode this status display shows the signal strength of each of two RF channels consequently with a dBm reading at the end of the second line.

R	F	S	i	g	n	a	l		L	e	v	e	I	
C	H	1	:		-	1	0	0	d	B	m			



**Figure 2 – Status Menu**

#### 4.3.2 Decoder Status

This screen shows the format of the incoming signal. If the decoder is not locked to incoming signal, then *UNKNOWN* will be displayed

D	E	C	O	D	E	R		M	O	D	E	:			
U	N	K	N	O	W	N									

#### 4.3.3 LAN IP ADDRS Status Display

This screen shows the LAN IP address that was established via the DHCP process with the server. These numbers are dynamically assigned and can change if the unit is disconnected and then re-connected to the LAN.

LAN IP ADDRS Status Display															
I	P		A	D	D	R		(	D	H	C	P	)		
x	x	x	.	x	x	x	.	x	x	x	.	x	x	x	

#### 4.3.4 Genlock Locked

This screen displays Genlock Status. It is functional only in AVC format. Display is shown below.

G	e	n	l	o	c	k		L	o	c	k	e	d	:	N
M	o	d	e	:	N	/	A	-	N	O	T		A	V	C

- ❖ **Genlock Locked:** – shows if Genlock is locked.
- ❖ **Mode:** – shows the reference signal format.

#### 4.3.5 Number of Programs

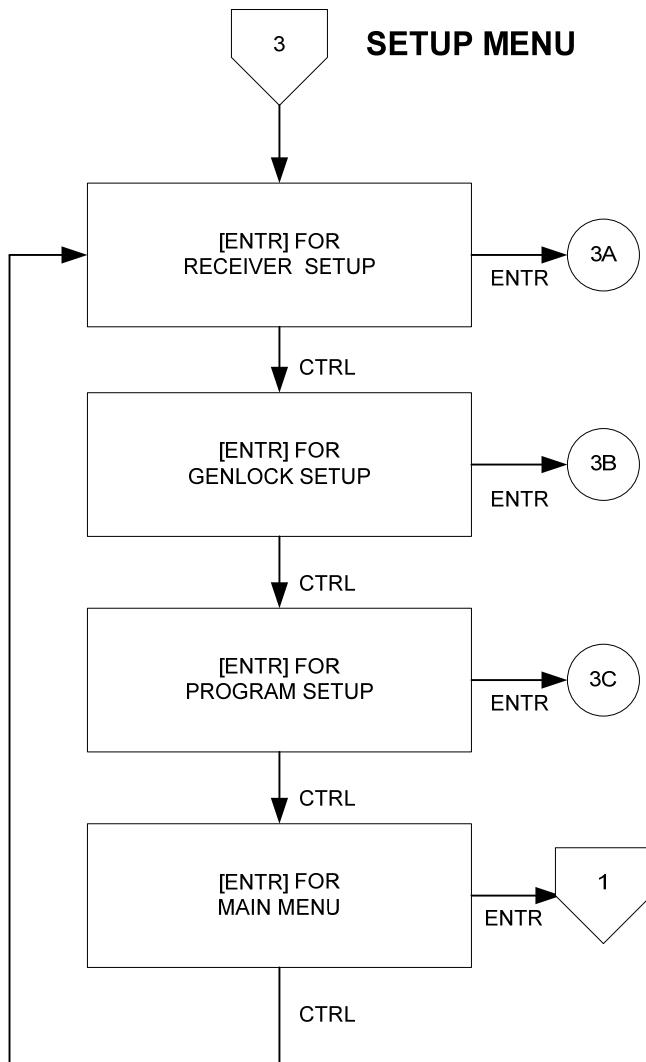
This screen shows number of programs in current Transport Stream. Pressing the *Enter* key while in this screen will take you to Program Setup Menu.

##### 4.3.6 Selected Program

This display shows the current selected program and then automatically cycles through PCR, Video, Audio and PMT PID-s for the selected program. Pressing the ENTR key while in this display take you immediately to the Program Setup menu.

#### 4.4 Setup Menu

This menu can be accessed from the Main Display by pressing CNTR button twice. The flow chart of MVRD Status Menu is shown in Figure 3. It consists of three submenus described below.



**Figure 3 – Setup Menu**

#### 4.5    Receiver Setup

If the receiver in ASI Input mode, this will only lead to Setup and then Main Manu.

##### 4.5.1    RX Input Source

In this submenu the user can select the input mode – RF or ASI In.

R	X		I	n	p	u	t		S	o	u	r	c	e	:
A	S	I	↑												

#### 4.5.2 RX Configuration

In this submenu the user can select the Configurations 1 to 16. Refer to section **Error! Reference source not found.** for details. The change will take place only after pressing *ENTR*. Second line displays the frequency in MHz's.

R	X		C	o	n	f	i	g	:	1	2	↑		
F	r	e	q	:	2	3	7	5	.	0	M	H	z	

#### 4.5.3 OSD Control

This screen is available only in MPEG2 or MPEG4 in Narrow Band Mode. On-Screen Display (OSD) shows the RF reception status on the composite video signal when the system is processing MPEG2 video. It allows the user to select *OFF*, *On Spectrum A* or *On Spectrum B* by toggling  $\downarrow\uparrow$  buttons. *Enter* saves the selection.

M	P	E	G	2	/	M	P	E	G	4		O	S	D	:
O	N		(	S	P	E	C	T	R	U	M		A	)	↑

#### 4.5.4 RF Input Freq

In this submenu the user can change the RF Frequency in 0.1 MHz steps. Pressing *ENTR* will save the frequency in the current configuration.

### 4.6 Genlock Setup

#### 4.6.1 Genlock On/Off

The first display presents the user with the options to turn Genlock *ON*, *OFF* or to *AUTO*. If the selection is *ON* and there is no reference signal or incorrect reference on the SYNC input (see section 5.2.6) the red error LED on the front panel lights. Otherwise, if the reference is correct the green *LOCK* LED on the front panel lights. The Genlock is disabled regardless of type of reference signal on the SYNC input if this mode set to *OFF*. In *AUTO* mode Genlock automatically locks if there is a reference signal on the SYNC in which it can lock to.

#### 4.6.2 Genlock Offset

The next two displays give the user the option of adjusting the Genlock signal offset in terms of pixels or lines. The number of pixels or lines is determined by the type of reference signal on the SYNC input.

The remaining displays allow the user to either return to the MAIN menu or to the SETUP menu. Once Genlock has been setup it can be monitored in the STATUS menu, see section 4.3.4. The STATUS menu Genlock screen shows if Genlock is locked, if it is ON, OFF, or in AUTO mode, if a reference signal is present (and the format), and the output video format the decoder is decoding.

## 4.7 Program Setup

The *PROGRAM* menu allows the user to choose *AUTO* or *MANUAL* mode detection. If decoding a multi-program stream then *MANUAL* mode offers the user the ability to choose the program to be decoded. For TS with a single program *AUTO* mode is recommended. If the Transport Stream has multiple programs and the unit is in *AUTO* mode, then the first program detected (from the PAT table) is decoded.

### 4.7.1 Program Mode

The flow chart of the Program Setup submenu is shown in Figure 4. Pressing ENTR will take the menu to the following screen:

A	V	C		P	r	o	g	r	a	m				
M	o	d	e	:	M	A	N	U	A	L	↑			

The user can change the Program Mode in this submenu.

The next screen is only available in Manual mode. It will display the selected Program number and a message if the decoder is not locked.

M	a	n	u	a	l		P	r	o	g	a	m	:		
				1	↑		N	O	T		A	V	A	I	L

►Note: If the unit is power cycled and it was previously set for *MANUAL* program detection it remembers the specific program number it was decoding. Hence if for some reason that particular program number is no longer present then another program number needs to be selected from the “*MANUAL PROGRAM*” display in order for decoding to continue.

### 4.7.2 Selected Program

Selected program submenu contains information about the following PID-s: PCR, Video, Audio and PMT. These items are displayed one line at the time and are continuously cycled until the CTRL key is pressed.

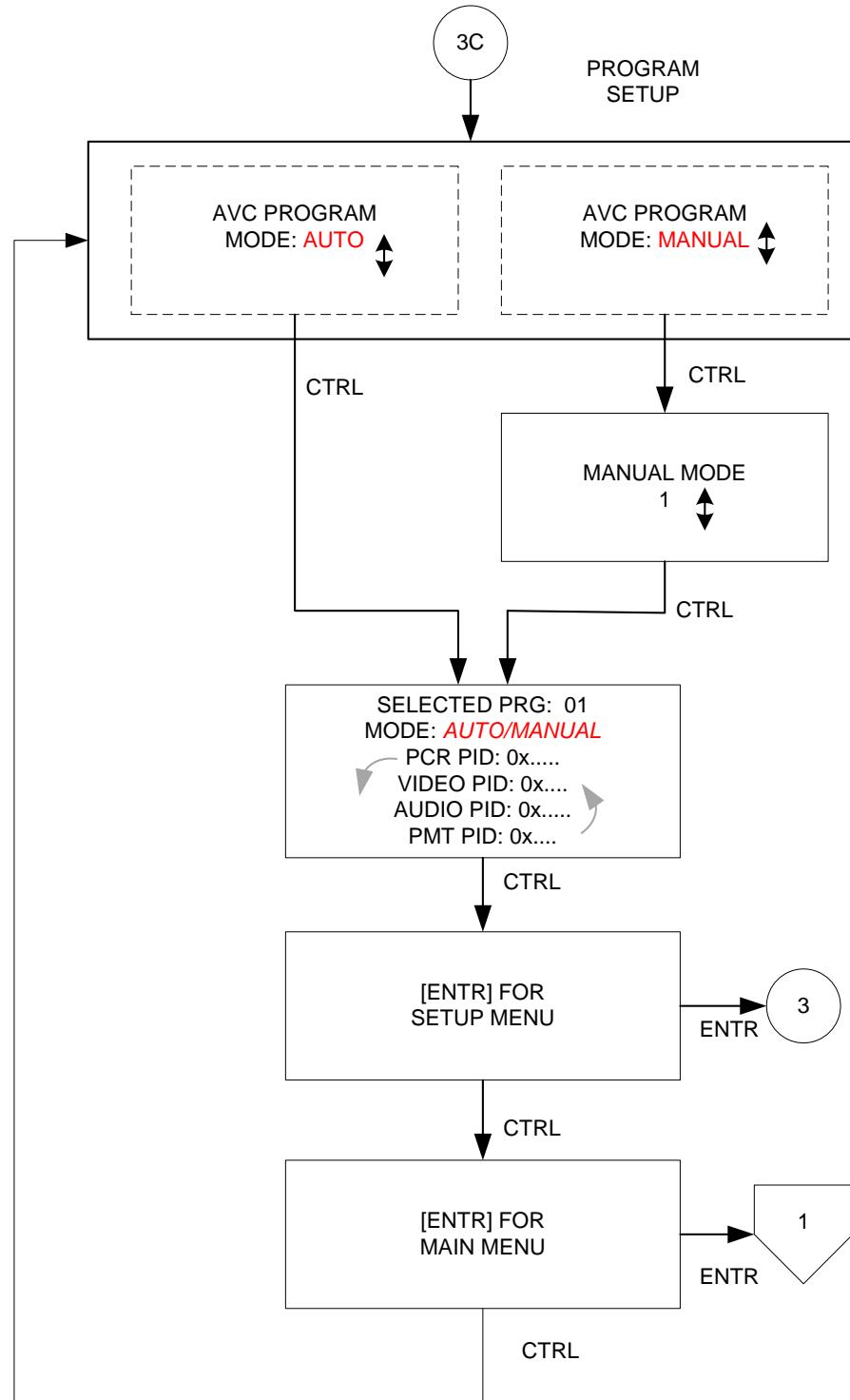
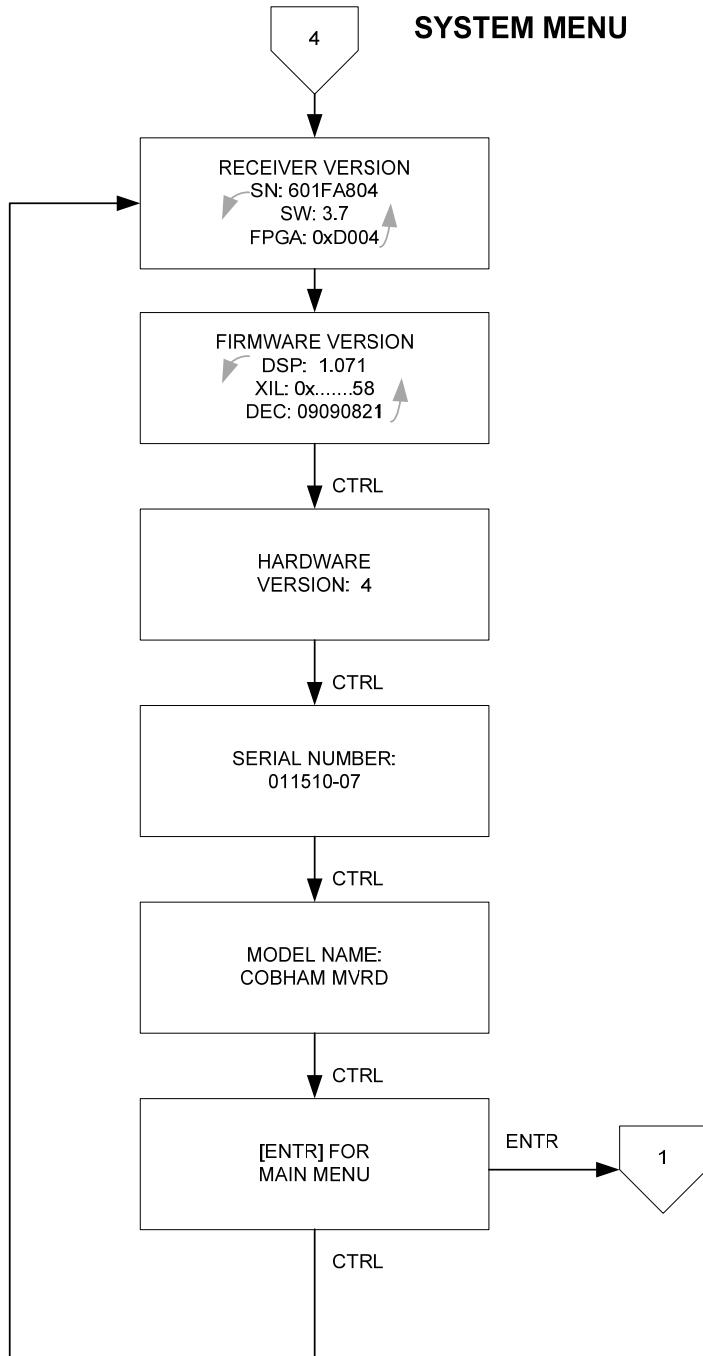


Figure 4 – Program Menu

#### 4.1 System Menu

The flow chart depicting the System Menu is shown in Figure 5. System Menu displays Versions for Firmware Components, Hardware Version and unit serial number.



**Figure 5 – System Menu**

## 5. Remote Control

The MVRD can be remotely controlled from an IBM PC via either the USB interface or a LAN interface\*\*. Currently, the LAN control is mainly used for Firmware Upgrades.

When a MVRD is connected to a computer GMS' M.S. Windows control & monitoring SW can be used. As previously stated, GMS' M.S. Windows applications provide two (2) levels of access. Level 1 (User-Level) is not password protected. The primary purpose of the User-Level access is to allow field personnel to have the same level of control that is normally available on the equipment's local control panel and at the same time provide complete visibility of the details of each individual set-up group. Additionally, they will be allowed control access to specific parameters defined in Level 2.

Level 2 (Administrator-Level) is password protected and allows administrators complete access and manipulation of all software parameters. Administrators can define set-up groups with specific user defined names. They also have the ability, on a parameter by parameter basis, to grant control to the User-Level of any set-up parameter.

Configuration, control and monitoring of the MVRD units are done by using GMS' optional (sold separately) MS Windows-based VR Link Configurator software program. This Graphical User Interface (GUI) program provides the user with a straightforward way to interface to the MVRD units. During normal operation, once a link is established, the Link Configurator GUI does not need to be active and can be disconnected from the unit. The software part number is 630-SW0093\*, VR Configurator Application.

\*\*Note: In Development

### 5.1 VETA Configurator Functions

The VETA Configurator programs provide the user access to many different configurations, control and monitoring options. For detailed instructions on using the *VETA Receiver Software* that is used to control the MVRD refer to 100-M0131 which can be found on GMS' WEB site.

The Control Software has two levels of control – Administrative and User. Personnel with User level Control can only change 16 preset configurations. Administrator has access to all MVRD receiver parameters. GMS provides “Default Settings file” that easily can be loaded into the unit. Changes to set-up groups can be made with the VETA Receiver software.

## 6. Initial Check Out

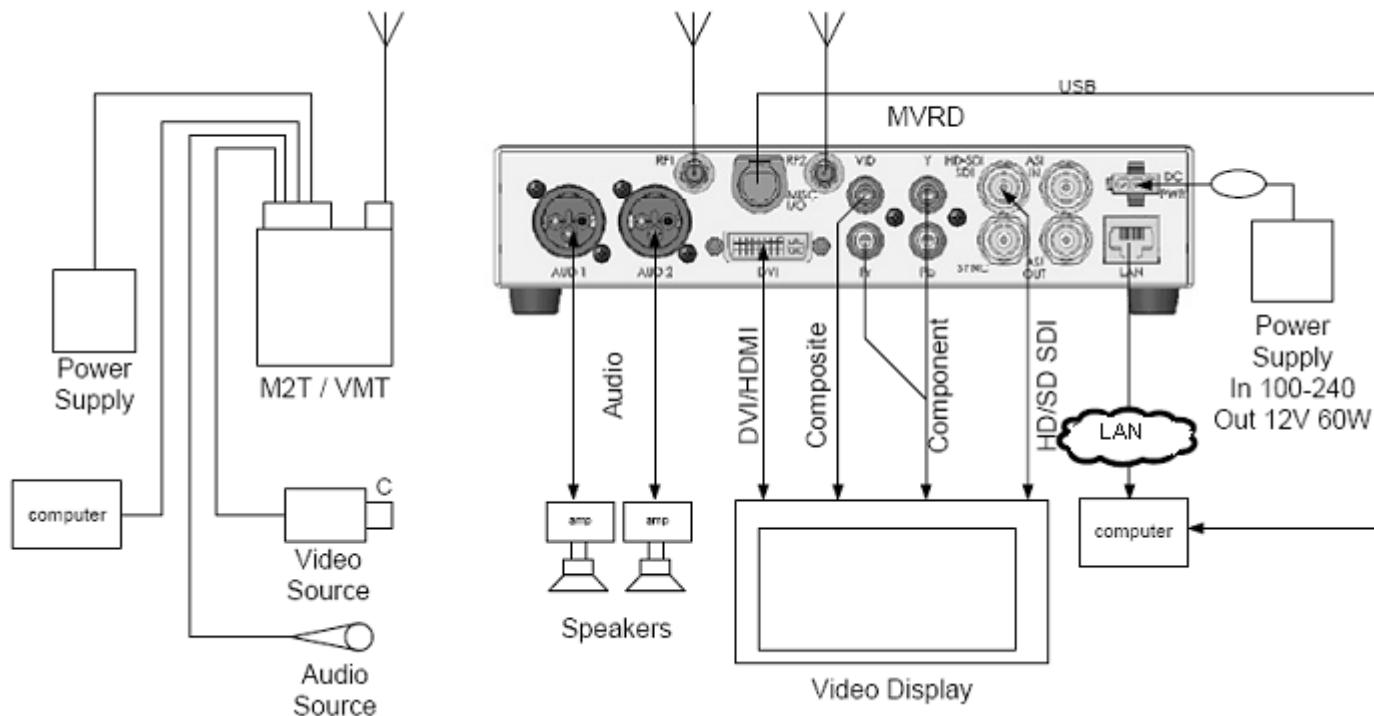
Prior to installing a MVRD unit into the desired target environment, an initial checkout should be performed to ensure proper operation of the unit. The initial checkout consists of configuring a basic MDL (Messenger Digital LINK) wireless link.

### 6.1 Deploying and Operating the MVRD

The MVRD is a tactical digital video receiver-decoder and the following guidelines should be employed when using the equipment.

- Depending on the RF environment (line of sight or non line of sight) and the power of the transmitter (100mW or 1W), the MVRD will operate at a range typically 300m to 1km from the target transmitter in an urban environment.
- If the MVRD is being operated inside a building or vehicle, better results may be achieved by using the external antenna function and deploying the antennas to the outside of the building or vehicle.
- To prevent damage to the MVRD, it should not be operated too close to the transmitter (within 5m typically, further if the transmitter is greater than 1W in power).

Figure 6 shows a basic MDL configuration wireless link. The steps necessary to setup the configuration shown are stated below:



**Figure 6 – Basic MDL Setup**

- Install Omni-directional antennas (or ones best suited for the application) onto the RF IN A and RF IN B ports on the MVRD and one on the SMA RF connector on the Messenger 2 transmitter or VETA Messenger transmitter. If using VETA Transmitter, refer to Corresponding manual for interfaces.
  - ◆ Using the VMT as your test TX allows you to check NTSC or PAL with MPEG-2 or MPEG-4 part 2 compression. In this mode, the only valid output video source on the MVRD will be the composite output port.
- Attach the M2T (Messenger 2 transmitter) power cable and apply **+12VDC** to the red pigtail and GND to the black pigtail. Ensure power supply can supply at least 1.5A at +12VDC.
- Attach a composite video source to the BNC video of either TX for SD testing and analog audio source to the XLR input cable's that is located on the M2T breakout cable. Connect a HD-SDI source to the M2T's BNC (Female) SDI input for HD/SD AVC testing.
- If you are using a M2T with factory default set-up groups, then set the first 2 rotary switches on the M2T to the desired preconfigured setting 1 – 20. See Appendix B for matching the M2T's 20 set-ups with the MVRD's 16 set-up
  - ◆ Note: Using the M2T as your test TX allows you to check NTSC, PAL, 480p, 720p, 1080i and 1080p with AVC (MPEG-4 part 10) compression. In this mode, all video output ports will be active. The composite output port is driven by an internal video scaler to produce a SD monitor output even when the system is processing SD. The video scaler currently has limited functionality. See **Error! Reference source not found.** for additional information.
- Attach the appropriate video output port on the MVRD to its matching video input port of a video display.
- Attach the audio output port on the MVRD to the input port of an audio amplifier.
- Attach the power cable assembly (780-C0451) to the MVRD and AC power source.
- Turn on the audio/video source and audio amplifier and video display.
- Turn on the MVRD with the “**PWR**” switch on the front panel (up is ON). The 2 front LED's will turn on then off and the front display will light up.
- Once the MVRD has powered-up, use the front user interface to set the appropriate preconfigured setting to match the transmitter.
- After approximately 5 seconds the front “**LOCK**” LED should turn a solid green and video should appear on the video display.
- If the green “**LOCK**” LED light does not come on and/or there is no video playing on your display, check the following:
  - Ensure the receiver and transmitter configuration numbers are set accordingly to the configuration map.
  - If not, change the settings on either the transmitter or receiver so they match up.
  - Ensure the MVRD and the TX is turned **ON**.
  - Ensure the video and audio are properly connected to the MVRD and the TX.
  - If the TX and RX are physically too close to each other, the RX may overload causing no or distorted Video. You may move the TX & RX further apart.
  - If the red LED stays on and the green led goes off, recycle power. If it persist contact Cobham/GMS.

The initial checkout described above is simply to check the basic video operation of the MVRD unit. Audio can also be checked by enabling audio in the test TX. See the operator's manual of the TX that you are using.



Figure 7 – OSD

## 6.2 Using of the On Screen Display

On Screen Display (OSD) tool, shown in Figure 7, is an extremely useful tool for system set-up and diagnostic. The displayed diagnostic data includes a spectrum display, signal to noise data, input power level and frequency. The received spectrum display is useful when checking for interference and signal quality.

After power up, OSD is available only when unit is locked to incoming RF signal. If the lock is lost afterwards, OSD still will be available.

When setting a VETA system up, the OSD should be used in the following way.

- Channel is clear. With the transmitter OFF, check that the channel is empty of interference signals, this is confirmed by ensuring that the reported power in the channel is at -95dBm or lower and that the spectrum is shown as a rounded dome with no obvious spikes or tones.
- Check Quality of Link. Switch on the transmitter and confirm that SNR is 6 or greater and that power level is at least -92dBm or greater. This represents approximately a 5dB margin. Failure of the link will occur when the power level reaches -97dBm or the SNR reaches 3dB.

## 7. Hardware Overview

### 7.1 Front Panel Description

Front Panel view of MVRD is shown in Figure 8.



**Figure 8 – MVRD, Front View**

#### 7.1.1 Power Control

Pushing the top portion of the switch turns the MVRD on.

#### 7.1.2 Local Control Panel

Local Control Panel consists of Display (Backlit LCD, Dual line, 16 characters per line) and 4-button keypad (Enter, Control, Up and Down).

Control, CTRL, is used to switch between control or status screens or multiple menu item groups  
Enter, ENTR, is used to switch current submenu.

UP and Down Arrows are used to move up and down menu items or option selection within a menu item.

Detailed front panel operations are described in Section **Error! Reference source not found.Error! Reference source not found.**

#### 7.1.3 Status Indicators

Lock LED is lit when the MVRD is receiving a valid MPEG Transport Stream (TS). There are three valid source selections; RF, ASI, and LAN\*\* for the TS. When RF is selected as the source the Lock LED also means that the receiver is receiving and demodulating a transmitted signal.

Error LED indicates that an error occurred in the unit. There are several reasons that the Error LED to light including:

- ❖ No TS
- ❖ PMT (Program MAP Table) indicates services that are not present in the TS
- ❖ Incompatible Compression Type – Cannot decode the incoming data.
- ❖ Internal HW/FW Error – Will output a code that is meaningful to factory personnel.

\*\*Note: In Development

#### 7.1.4 A/V Connectors

- ❖ Composite Video, Connector Type: RCA-F. This port is active for all valid operating modes of the MVRD. When processing SD MPEG-2, MPEG-4 Part 2 or MPEG 4 Pat 10 (AVC) the composite video output is directly from the associated decoder. When processing HD AVC the composite video comes from an internal Video Scaler.
- ❖ AUD 1 and AUD 2, Connector Type: RCA-F, Single Ended Line Level. Two RCA connectors are provided for audio outputs Left and Right. The output level is nominal line level with output impedance of 50 ohm. Audio is single ended. There are no audio gain adjustments.

## 7.2 Rear Panel Description

The Figure 9 shows rear view of MVRD unit. All the connectors are described below.

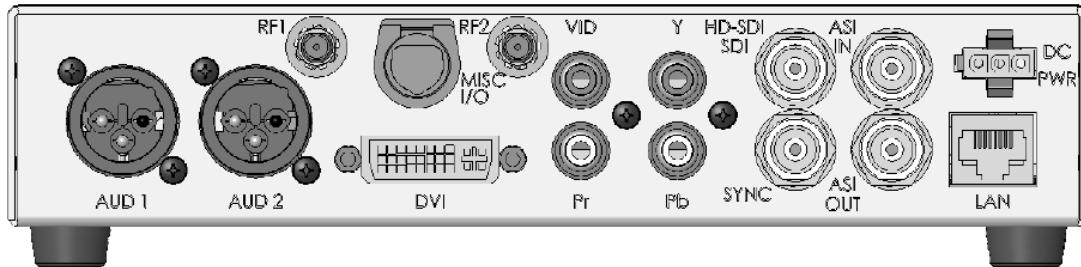


Figure 9 – MVRD, Rear View

### 7.2.1 DC Power

Mating Connector Type: AMD Tyco Electronics PN: 172166-1.

### 7.2.2 AUD1, AUD2

Signal: Audio, Balanced

Connector Type: XLR-M, 3 pin

### 7.2.3 RF1 and RF2

RF1 & RF2 – Receiver RF Inputs

Connector Type: SMA-F

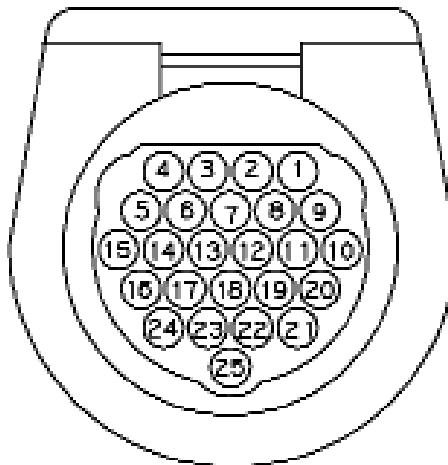
Maximum Operational Input: -20 dBm

Damage Level: > = +17 dBm

#### 7.2.4 MISC I/O

Miscellaneous connector – USB Control and Digital Audio Output\*\*  
Connector Type – Hypertronics D-series Circular connector

\*\*Note: In Development



**Figure 10 – Miscellaneous connector front view**

#### 7.2.5 DVI

Signal: Video, Component

Connector Type: DVI-I Socket – Female

☛ Note: Can be converted to HDMI (Video Only) with external adapter. (Sold Separately)

#### 7.2.6 Composite and Component VIDEO Outputs

VID

Signal: Video, Composite

Connector Type: RCA-F

Y, Pr, Pb

Signal: Video, Component

Connector Type: RCA-F

#### 7.2.7 HD-SDI/SDI

SMPTE standardized Serial Digital Interface (High or Standard Definition)

Source: Follows active selection of TS source.

Connector Type: BNC-F

### 7.2.8 ASI In

Inputs MPEG2 or MPEG4 compressed signal.

TS: DVB Compliant

Connector Type: BNC-F

### 7.2.9 ASI Out

Outputs MPEG Transport Stream; source is ASI In (loop through) or RF In.

TS: DVB Compliant

Connector Type: BNC-F

### 7.2.10 SYNC

Sync is an input is used to ensure coincidence of signals in time at a combining or mixing or switching point.

Connector Type: BNC-F

Function: Genlock, AVC HD/SD only

### 7.2.11 LAN

Provided for Ethernet connection; can be used for Video Streaming, updating Firmware and Control.

Connector Type: RJ-45

## 7.3 Video Scaler

Embedded Video scaler converts video signals from one size or resolution to another. When processing HD AVC the composite video comes from an internal Video Scaler.

The table below shows details of the scaling and the valid configurations.

► Note: The Video Scaler does not always accurately represent the HD signal. Test patterns with very narrow lines can be distorted by the scaler. However, it does an acceptable job of converting normal video from a camera.

► Note: Future enhancements will allow all the operating modes to be supported.

## 7.4 Using breakout cables

### 7.4.1 Power Cable w/AC/DC Power Supply

Use pigtail Power Cable to connect from an AC outlet to the power connector on the MVRD. See for detailed information on this cable (DWG #: 100-C0484).

► Note: you can wire directly to the DC Power connector to run the MVRD off of DC.

#### 7.4.2 MVRD CTRL Cable

Use 780-C0456 to connect from the MISC I/O circular connector to USB connector on the Personnel Computer (PC) that shall be used to control the MVRD.

## 8. Specification

### COFDM RF Input

Input Ports:	2
Connectors:	SMA-F
Input Impedance:	50 Ohms, <1.5:1 VSWR
Input Frequency:	0.9 to 8.5 GHz (In-Bands)
Frequency Accuracy:	(+/-5) ppm

### Demodulation

DVB-T # of Carriers:	2 K
DVB-T Bandwidth:	8/ 7/ 6 MHz
DVB-T Guard Interval:	1/32, 1/16, 1/8, 1/4
DVB-T FEC	1/2, 2/3, 3/4, 5/6
DVB-T Modulation	QPSK, 16 QAM, 64 QAM
Optional VETA Narrow BW Modes	
VETA # of Carriers:	400
VETA Bandwidth:	2.5 MHz or 1.25 MHz
VETA Guard	1/16, 1/8
VETA FEC	1/3, 2/3
VETA Modulation	QPSK, 16 QAM
Threshold:	(6, 7, & 8 MHz BW)
QPSK 1/2:	<-95 dBm
16-QAM 1/2:	<-89 dBm
64-QAM 1/2:	<-83dBm

(Optional Diversity can improve threshold by 2.5 dB) VETA BW Threshold: -100 dBm to -105dBm

### Serial Transport Stream I/O

#### General

Ports	RF, DVB-ASI or LAN IP**, selectable
ASI Serial TS Input/Output	
# of ASI Inputs:	1 , BNC-F
# of ASI Outputs:	1 (loop-through), BNC-F
Max TS Rate:	Up to 150 Mbps
LAN/ IP Serial Input/Output**	
# of Ethernet Ports:	1 , RJ-45
Streaming Format:	RTP/UDP; IP Unicast or Multicast
Supports MPEG-2 Transport Stream over UDP or RTP	
Output: DVB-ASI input can be reformatted for streaming and output at the same time that it is being decoded.	

### AVC Decoder (Video, 2 Audio)

#### General

Compatibility Standard:	MPEG-4 AVC/H.264 Baseline Profile Plus Interlace Support
Bit streams Accepted:	AVC video in MPEG TS per ISO/IEC 13818-2

Video Bit Rate:	PES packets per ISO/IEC 13818-1 1 Mbps to 60 Mbps
Video Decoder	
Format @ Frame rate:	1080P @ 60 Hz, 50 Hz, 30Hz, 29.97Hz, 25Hz 1080I @ 30Hz, 29.97Hz, 25Hz 720P @ 60Hz, 59.94Hz, 50Hz 480P @ 60Hz, 59.94Hz, 50Hz 480I @ 29.97Hz 576I @25Hz
Display modes supported:	Letterbox, Cropped
Aspect Ratio:	16 x 9, 4 x 3 (selectable - format dependant)
Systems Latency end to end delay:	~44ms (w/Messenger AVC TX Only, mode dependant)

### AVC Video Output

#### General

Output connectors: Qty 1 HD-SDI, Qty 1 HDMI, Qty 1 Component, (SD Only) - Qty 2 – Composite

Output formats supported: 1920 x 1080 Progressive  
1920 x 1080 Interlaced  
1280 x 720 Progressive  
720 x 480 Progressive  
720 x 480 Interlaced  
720 x 576 Interlaced

Frame rates: 60/50/30, 59.94/29.97, 25Hz  
(progressive/interlaced)

Aspect Ratio: 16 x 9 (fixed: 1080I, 720P)  
16 x 9, 4 x 3 (selectable: 480P)

Display Modes (selectable): HD: Letterbox\*\*, Cropped, Full  
SD: Letterbox\*\*, Cropped

### HD-SDI (High Definition Serial Digital Interface)

Standard: SMPTE 292M  
Data Bit Rate: 1.485 Gbps  
# of Serial Outputs: 1  
Connector: BNC (x1), female

### Embedded Audio (Future Option)

Embedded Audio format: SMPTE299M  
Sample rates supported: 32, 44.1, 48 KHz  
Sample rate out: 48 KHz  
# embedded Audio: 4 (2 stereo pairs)  
Audio types supported: MPEG2 layer 1 and 2, or  
ADPCM (Future Option)  
Embedded audio control: Selectable, .type./enable

(each pair independently controlled)

## Analog Video

### SD

Video format standards: PAL & NTSC Composite  
# of Analog outputs: 2  
Connectors: RCA-F

### HD/SD

Video format standards: Component  
# of Analog outputs: 1 set (Y, Pb, Pr)  
Connectors: RCA-F

### DVI (Digital Visual Interface)

DVI Connector: DVI-I Socket - female

☛ Note: Can be converted to HDMI (Video Only) with external adapter (Sold Separately)

## MPEG-2/4 Video Decoding

Compression Standard: MPEG-2 or MPEG-4  
Chrominance Profile: 4:2:0  
Line Standard: 525 and 625 (NTSC/PAL)  
Horizontal Resolution: 704, 528, 480, 352 pixels  
Systems Latency end to end delay: ~40ms for 6,7, or 8 MHz, Narrow BW to ~120 mS  
(with VETA TX Only, mode dependant)  
Video Outputs: Composite w/OSD  
Standards: NTSC (with and without pedestal) or PAL  
Video Connectors: Qty 2 Composite – RCA-F (One on Front Panel,  
One on Rear Panel)  
Output Impedance: 75 Ohms  
Output Level: 1 Vpp  
Frequency Response: 10 Hz to 4 MHz, (+/-) 1.5 dB

## Audio Decoder

Decoder Capabilities: MPEG-1, layers I and II  
MPEG-2, layer II,  
NICAM (Veta Mode Option)\*\*  
MPEG-2, MPEG-1  
MPEG-2 PES Formats:  
Audio Source: Selected Audio Services 1-4

## Audio Output

### General

# of Services: AVC Mode: 4 Mono or 2 Stereo Pairs  
MEPG-2/4 Mode: 2 Mono or 1 Stereo Pairs

### Analog Audio Out

Output Type: Balanced, 2 channel pairs (+/-), Left/Right  
Connectors: Qty 2 – XLR-M  
Qty 2- p/o High density 15-pin D-sub, female

Cable w/Optional connectors:DB-15 to Qty 2 - XLR-M  
Impedance: 600 Ohms nominal

#### Remote Operation/Update Interface

Type: Ethernet, 10/100 BaseT  
Connector: RJ45

#### Serial Remote operation interface

Type: USB  
Connector: Part of MISC I/O connector

#### Front Panel Indicators

Input LED: Green indicates valid input on selected input,  
Off indicates no valid signal on the selected input  
Error LED: Red indicates error is occurring  
OFF indicates no errors detected

#### Power

DC Input: +9 to +18 VDC  
DC Power: 15 Watts  
  
Battery Operation Anton Bauer or IDX  
  
AC Input Option: Via External Power Supply  
Voltage Range: 100 - 120/ 200 – 240 VAC  
Power: Maximum – 200 W  
Frequency: 47 – 63 Hz  
Line cord: Detachable, 3-prong  
Cooling: Forced air

#### General

Operating Temperature: 0 °C to 50 °C  
Operating Humidity: <95% Non-Condensing

#### GENLOCK Option (Future Option)\*\*

Genlock capability: AVC HD/SD Only  
Genlock Reference: 480i @ 29.97, Ref NTSC “black and burst”  
1080i @ 29.97 fps  
Ref NTSC “black and burst” or 1080i tri-level sync @ 29.97 fps  
1080i @ 30 fps – Ref 1080i tri-level sync @30fps  
1080i @ 50 fps – Ref 1080i tri-level sync @50fps  
720p @ 50 fps – Ref 720p tri-level sync @ 50 fps  
720p@ 59.94 fps – Ref 720 tri-level sync @ 59.94 fps  
720p @ 60 fps – Ref 720 tri-level sync @ 60 fps

\*: Option

\*\*: In Development. This feature will be supplied as a field FW update, when available.

## Appendix A – Default Settings C2-Band

PARAMETER	CONFIGURATIONS															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Config #</b>	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T
<b>Unit Mode</b>	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200
<b>BDC LO</b>	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
<b>BDC Gain</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>COFDM BW</b>	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	6Mhz	6Mhz	6Mhz	7Mhz	8Mhz	8Mhz	8Mhz
<b>RF Frequency</b>	4400	4700	5000	4400	4700	5000	4400	4700	5000	4400	4700	5000	4400	4400	4700	5000
<b>Modulation GI</b>	1/4	1/4	1/4	1/8	1/8	1/8	1/8	1/8	1/8	1/32	1/32	1/32	1/16	1/4	1/4	1/4
<b>OFDM Polarity</b>	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
<b>NTSC Format</b>	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC
<b>Blue Screen on no Video</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>MPEG4 deblocking Filter</b>	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
<b>On screen Display</b>	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
<b>Auto Spect Detect</b>	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
<b>Descrambling</b>	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
<b>LNB Power</b>	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
<b>Power up Video Format</b>	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525

## Appendix B – Configuration Map

M2T Group Number	MVRD Group Number	M2T Group Number	MVRD Group Number
GP1	GP10	GP11	GP7
GP2	GP11	GP12	GP8
GP3	GP12	GP13	GP9
GP4	GP10	GP14	GP7
GP5	GP12	GP15	GP9
GP6	GP10	GP16	GP7
GP7	GP11	GP17	GP9
GP8	GP12	GP18	GP7
GP9	GP10	GP19	GP9
GP10	GP12	GP20	GP9

## Appendix C – Troubleshooting Section

Fault	Action
No RF Link	<ul style="list-style-type: none"> <li>• Check if Input Source selected as RF</li> <li>• Check if the following parameters of the Transmitter and corresponding Receiver match: <ul style="list-style-type: none"> <li>-Frequency and Bandwidth</li> <li>-Guard Interval</li> <li>-Spectral Inversion</li> </ul> </li> <li>• Check if the down converters operate correctly: <ul style="list-style-type: none"> <li>-Correct LO is set</li> <li>-BDC power is On.</li> </ul> </li> </ul>
Poor Link Performance	<ul style="list-style-type: none"> <li>• Interference. Should an interfering RF signal occur on the same frequency the performance of the link will be affected. Remove the interferer or move to an alternative frequency.</li> <li>• Reduced transmit power, ensure that the attenuation setting on the transmitter is appropriate for direct output, or for amplifiers connected.</li> <li>• No Diversity operation. Ensure both down converters are operational.</li> </ul>
Blue screen or Frozen screen at receiver	<p>Check RF/Demod Lock– see “No RF Link” section above. If Demod Lock is OK but Packet errors are not 0 then see section Poor Link Performance above.</p> <p>If the RF/Demod Lock is OK and packet errors are 0 then –</p> <ul style="list-style-type: none"> <li>- Check video is enabled at the transmitter with the proper/matching format.</li> <li>-Check correct unit name is selected at the receiver to match the transmitter.</li> <li>-Check scrambling keys are matched.</li> </ul>
Reduced Image quality	<ul style="list-style-type: none"> <li>• Image quality is affected by the selected horizontal resolution. The image will become progressively softer for each horizontal resolution below the sharpest resolution of 704 pixels. It is advisable to select a horizontal resolution that matches the resolution of the camera.</li> <li>• Image quality is also affected by the video bit rate which can be read from the video bit rate field of the transmitter controller. The standard setting is 2.3Mb/s. However enabling audio, particularly the high quality audio modes, will reduce the video bit rate substantially. Therefore ensure an appropriate audio mode is selected or audio is fully disabled.</li> </ul>

## Appendix D – References

For more detailed information on GMS products described in this manual, download the manuals below from GMS' WEB site ([www.cobham.com/gms](http://www.cobham.com/gms)) or contact GMS customer Service department.

- Operations Manual, VETA Receiver 100-M0087
- Operations Manual, VETA Receiver SW 100-M0131
- Operations Manual, VETA Transmitter 100-M0089
- Operations Manual, M2D Decoder 100-M0134